Before the
Federal Communications Commission
Washington DC 20554

In the Matter of	)	
	)	GN Docket No. 17-183
Expanding Flexible Use in Mid-Band	)	
Spectrum Between 3.7 and 24 GHz	)	
	)	
	)	

REPLY COMMENTS OF THE
NATIONAL SPECTRUM MANAGEMENT ASSOCIATION

George Kizer President,
NATIONAL SPECTRUM MANAGEMENT
ASSOCIATION
P.O. Box 528
Englewood, NJ 07631

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APPENDIX: Buried Fiber Optics Cable Installation Costs

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REPLY COMMENTS OF THE NATIONAL SPECTRUM MANAGEMENT ASSOCIATION

The National Spectrum Management Association ("NSMA")[1] submits these reply comments regarding the above captioned Notice of Inquiry ("NOI").

A. INTRODUCTION

In this NOI the Federal Communications Commission ("FCC" or "Commission") seeks input on potential opportunities for additional flexible access—particularly for wireless broadband services—in spectrum bands between 3.7 and 24 GHz. Their stated goal is the establishment of comprehensive, sound, and flexible spectrum policies, enabling innovations and investment to keep pace with technological advances, and maintaining U.S. leadership in deployment of next-generation services.

During the Comment phase of these proceedings the various commenters resisting the introduction of new services into the bands of interest made the following points:

1. Existing users provide essential services which must be protected from interference.
2. Unmanaged new users will induce unacceptable levels of current system performance degradation.

[1] The NSMA is a voluntary association of individuals involved in the spectrum management profession including service providers, manufacturers, frequency coordinators, engineers and consultants. NSMA's goal is to promote rational spectrum policy through consensus views formulated by representatives of diverse segments of the wireless industry.

3. There is no frequency interference mitigation methodology currently in operation anywhere in the world which would manage new non-fixed service users in a fixed service band to needed levels of performance and reliability.

The above issues have, in our opinion, been adequately communicated and supported.

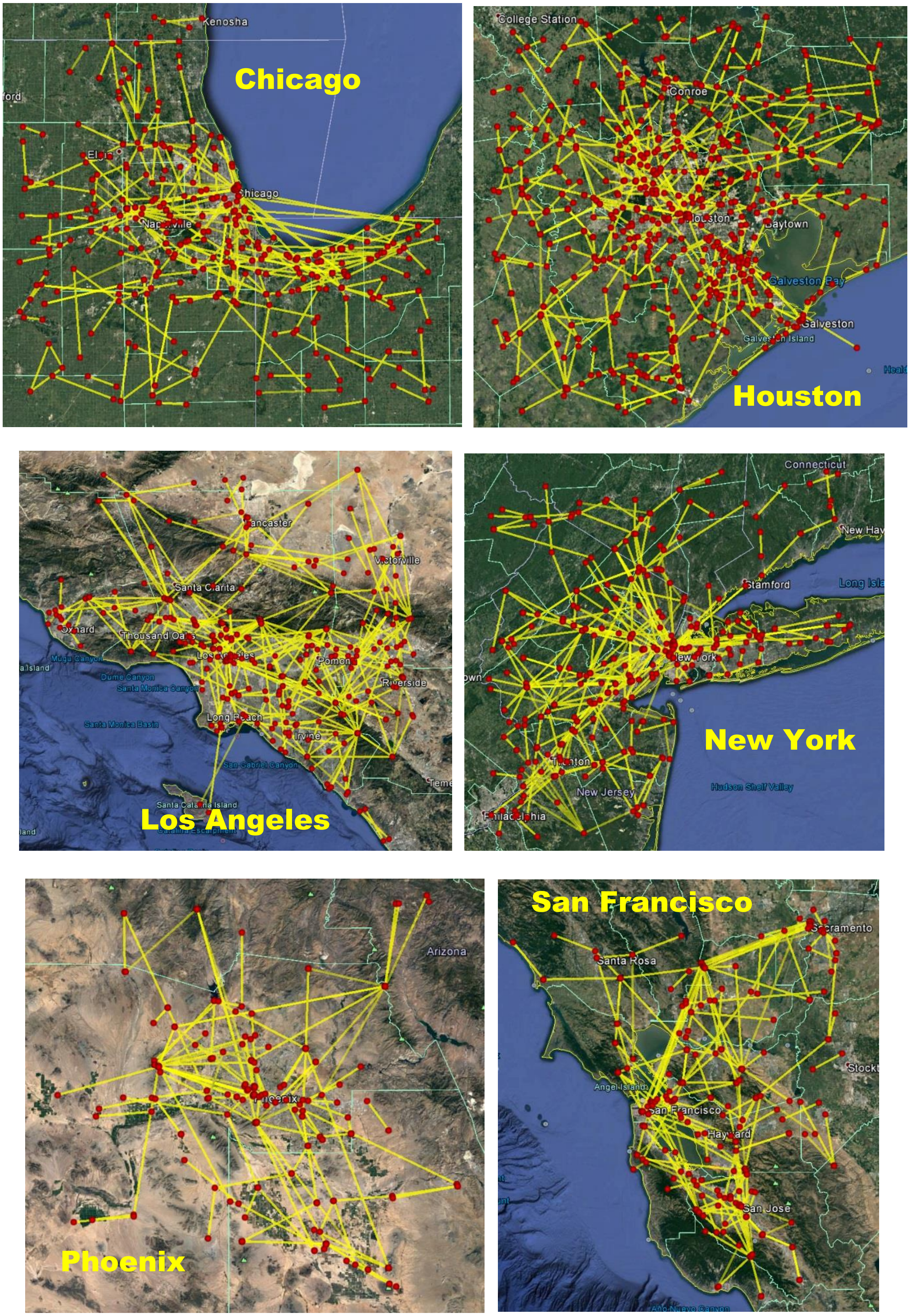
The various commenters for the introduction of mobile services into the proposed bands made the following points that others have shown to be incorrect:

1. New unmanaged broadband services could co-exist with incumbents without impact.
2. New broadband services could co-exist with current users if some available form of spectrum management is employed.
3. Existing users should be removed from the band to make way for new users.

We believe the above positions could benefit from additional comments.

B. Can new unmanaged broadband services co-exist with current users without impact?

Generally, the proponents of the peaceful coexistence position assume the new broadband users will be able to avoid the main beam of the existing fixed users' receivers. We will investigate the distribution of fixed point to point microwave radio paths in major U. S. cities. The following illustrations display the locations of all FCC Universal Licensing System ("ULS") recorded 30 MHz channel duplex fixed radio paths in the lower 6 GHz (5.925 to 6.426 GHz) band inside a city-centered square 120 miles on a side.


Chicago
Kenosha
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Houston
College Station
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Baytown
Galveston Bay
Galveston
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Los Angeles
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Victorville
Santa Clarita
Oxnard
Thousand Oaks
Los Angeles
Pomona
Riverside
Long Beach
Irvine
New York
Connecticut
Stamford
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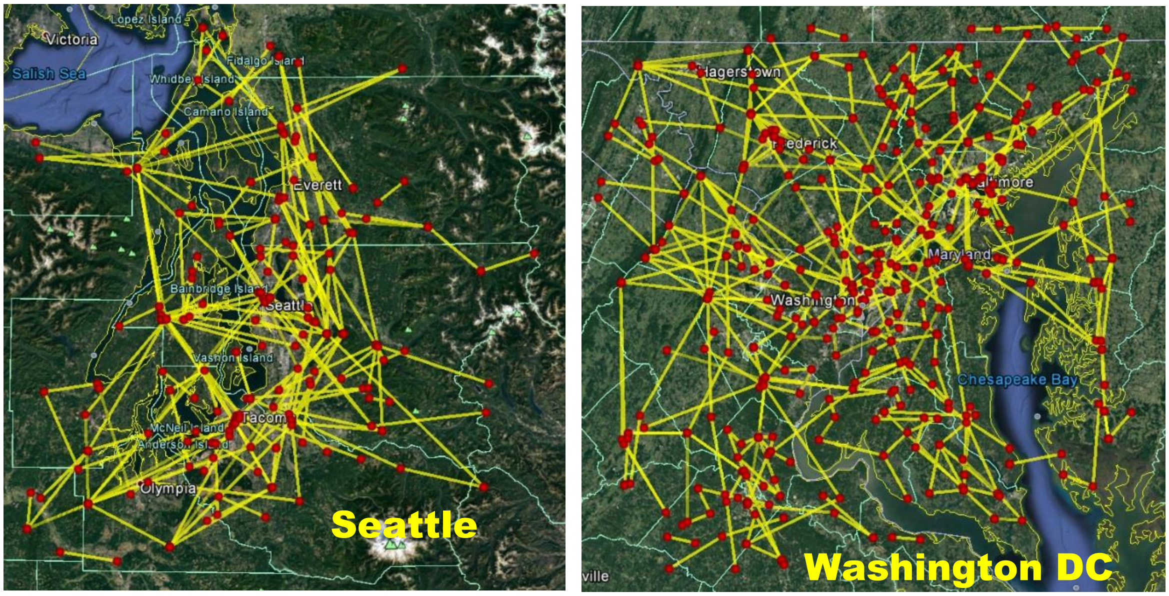

Lower 6 GHz Licensed 30 MHz Channel Duplex Fixed Point to Point Radio Paths

As the FWCC noted[2], building walls provide very little shielding to RF signals at 6 GHz. The unlicensed broadband users are unlikely to find an urban location whereby they avoid a fixed service path.

C. Can new broadband services co-exist with current users if some form of spectrum management is employed?

Spectrum management inherently requires knowledge of operation location(s) and related technical parameters. It is not clear how this would be accomplished for new broadband users if they are mobile. This issue has yet to be addressed. Surprisingly a similar issue also exists for the current radio systems. The Commission does not know where all of them are located.

[2] Comments of the Fixed Wireless Communication Coalition ("FWCC"), GN Docket No. 17-183, Appendix, page vi (October 2, 2017)

1. As is the case with any large data base, errors are known to exist in the public FCC fixed service license data bases (such as the ULS data base). Site coordinate inaccuracies are the most troubling but missing or inaccurate equipment data are also issues. Under the current FCC fee structure, licensees are charged to make corrections or delete paths (one exception: Common Carriers can make minor changes for no charge.) and fines for data errors are rarely enforced. Consequently, motivation to correct the data is low and errors exist in the fixed point to point microwave radio service data. Similar errors have been noted in the fixed satellite service data base[3]. While we agree with CTIA[4] that an investigation into whether unlicensed can co-exist with incumbent radio operations should be based upon a comprehensive engineering-based study, we question if this is possible without accurate FCC ULS, NTIA and/or private-sector data bases of existing, deployed radios.

2. Satellite licenses only cover operators engaged in two-way satellite transmission. The NOI stated that there are approximately 4,700 of these C-band earth stations registered in the FCCs database. This database does not cover receive only terminals which are also accorded interference protection. The NAB[5] noted that " ... there are a large number of additional earth stations that are not required to register because the Commission generally does not allow registration of receive-only antennas smaller than 4.5 meters in diameter. Further, even for earth stations with antennas larger than 4.5 meters, registration is voluntary. NAB believes there are

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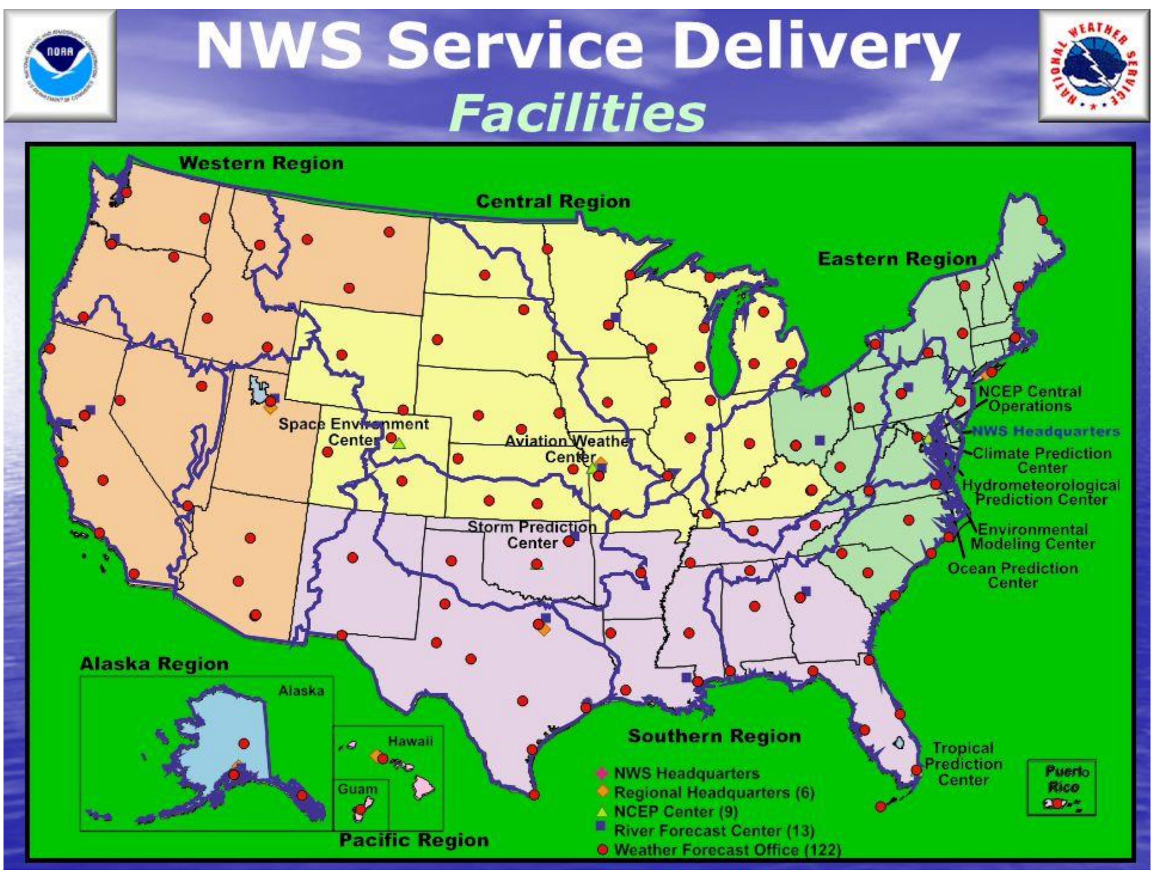
[3] Comments of Google LLC and Alphabet Access, GN Docket No. 17-183, pages 4 -7 (October 2, 2017)

[4] Comments of CTIA, GN Docket No. 17-183, pages 4 - 7 (October 2, 2017)

[5] Comments of the National Association of Broadcasters, GN Docket No. 17-183, pages 3 and 3 (October 2, 2017)

thousands of unregistered earth stations operating in the C-Band. Many of these stations are used at cable, satellite and telco headends across the U.S. to receive programming. Any cost benefit analysis of expanding use of the C-band must take into consideration [the risk of interference into] all existing use[r]s of the band, not only registered users." It is unknown how many of these earth stations are deployed. Various informal sources suggest anywhere from “a few thousand” to as high as “ten thousand.”

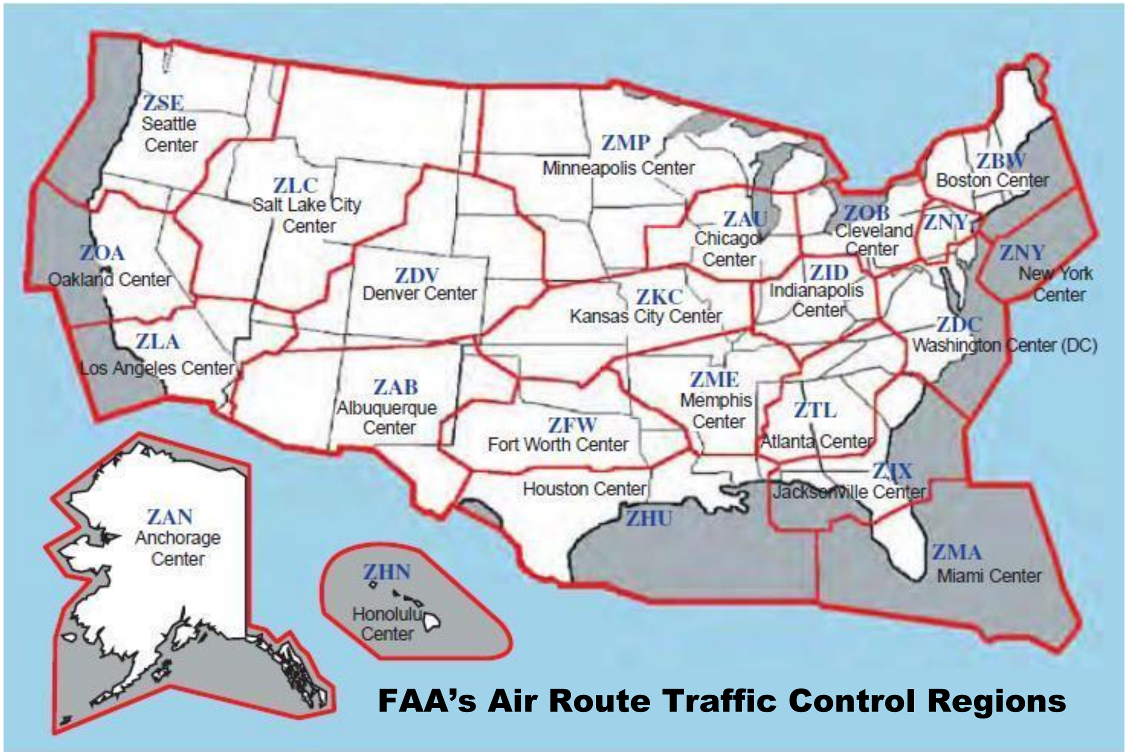
3. Another consideration is non-FCC managed receive stations that operate in C-band. National Oceanic and Atmospheric Adminisration’s (“NOAA’s”) National Weather Service (“NWS”) receives weather and water data via receiving systems in C-band (3.7 – 4.2 GHz). About 167 ground locations, within NOAA and the FAA, receive data via the Satellite Broadcast Network (also known as NOAAPort).



Scientific workstations, used by weather forecasters and hydrologists receive all their source data from NOAA satellites, terrestrial sensors and radars via the Satellite Broadcast Network in 3.7 – 4.2 GHz spectrum. These scientific workstations, called the Advanced Weather Interactive Processing System ("AWIPS"), support forecast meteorologists and hydrologists at the following Federal locations:

- All 123 NWS Weather Forecast Offices, located in all 50 states, plus Guam and Puerto Rico
- All 13 River Forecast Centers within the United States
- All 7 National Centers such as the National Hurricane Center, Storm Prediction Center, Weather Prediction Center, Ocean Prediction Center, Space Weather Prediction Center, Aviation Weather Center, Environmental Monitoring Center
- All 22 Federal Aviation Administration's Center Weather Service Units (CSWU) located in each Air Route Traffic Control Centers
- 4 Network Control Facility locations (operational and developmental)

Meteorologists staff the various NWS and FAA weather units, using the data received in 3.7 – 4.2 GHz, for major sources of weather data and weather model outputs. These facilities provide all the weather forecast and warning products issued within the United States, plus operational decisions on the rerouting of aircraft within the National Air Space.



Forecasters use the data from the various channels carried via the 3.7 – 4.2 GHz commercial satellite relay as the basis for the generation of weather products necessary for the safety of life and property and in support of industry segments of weather-sensitive industries.

Additionally, the National Weather Service provides geostationary satellite coverage of portions of the Pacific Ocean, by receiving Japan's Himawari series of weather satellites in C-band at 4.1 GHz. These regions are out of view of the U.S. Geostationary Operational Environmental Satellite ("GOES") over the Western United States, and the Himawari satellites provide the primary geostationary weather data in those areas. Interference to Federal receiving stations in the Pacific would impact forecasting in that region and the surrounding broad ocean areas. Other Federal agencies, including various branches of the Defense Department, utilize NOAAPort receivers to obtain weather data.

Non-Federal usage of the NWS Satellite Broadcast Network is wide spread, with aviation users, academia and private sector meteorological users operating their own receive only

NOAAPort systems. Some television stations receive NOAAPort directly. Some private sector users add additional data above and beyond that received from NOAAPort to further enhance data availability and content.

The use of this particular spectrum provides reliable communications during precipitation and severe weather events; as noted by the Satellite Industry Association[6], "C-band spectrum is resistant to rain fade and allows broad coverage areas, making C-band satellite service ideal for customers … that require highly reliable nationwide distribution networks." Moving to commercial satellite distribution at higher frequencies would result in more disruptions during weather events and smaller beams that would not cover the broad area necessary to reach all the required Federal offices.

The National Weather Service announced on October 23, that they would be moving their NOAAPort/Satellite Broadcast Network from the current FSS satellite provider to the Galaxy 28 satellite in January 2018, requiring users to repoint their receiving systems. If sharing proposals create interference to these DVB-S2 systems, resulting in loss of the downlink, significant impacts to weather users could impact the time-sensitive delivery of environmental data to public and private sector forecasters.

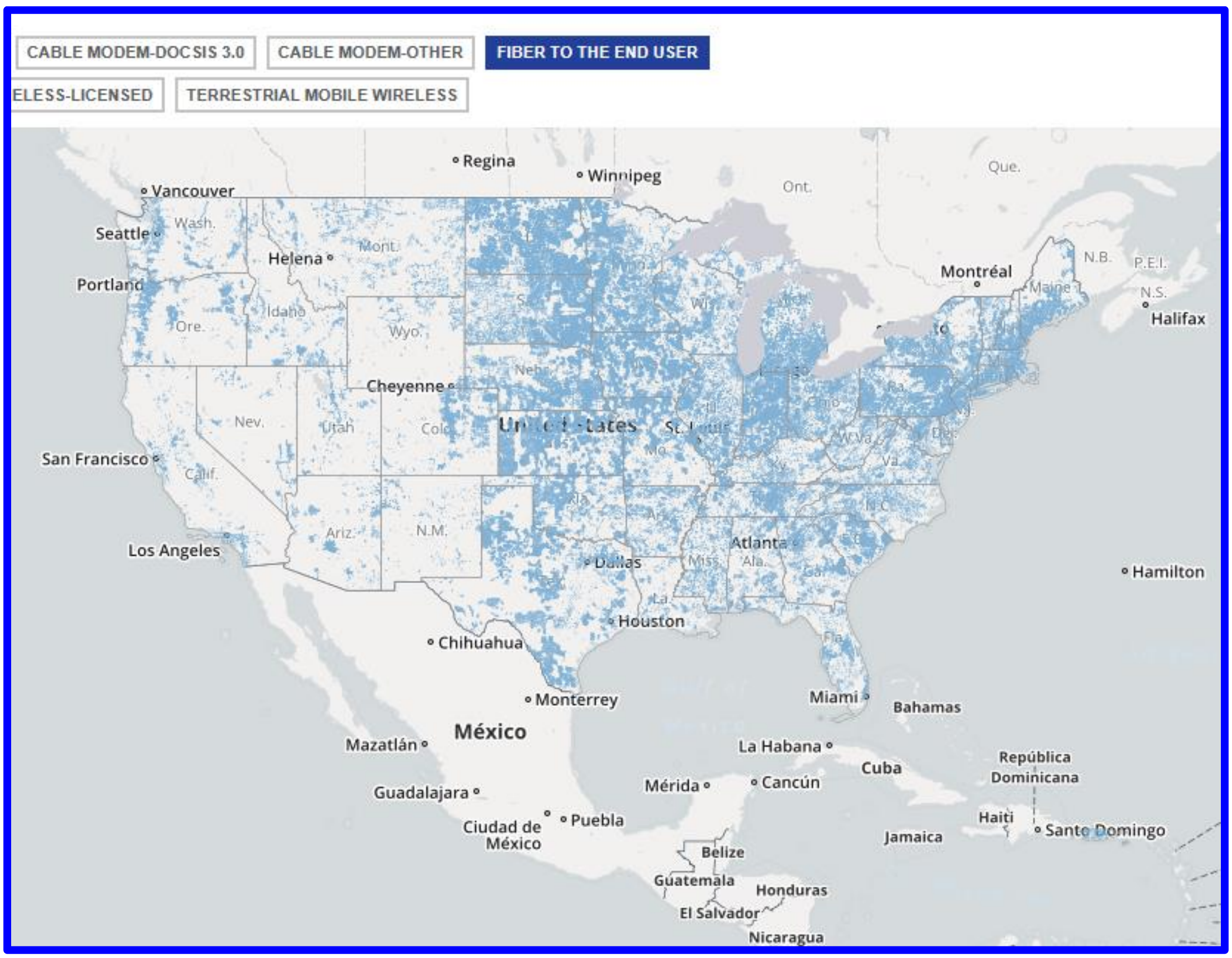
D. Can existing users be removed from the existing bands to make way for new users?

One suggestion was to move the existing system to fiber optics operation. Operators will find it prohibitively expensive (see Appendix), too long to deploy, operationally inflexible and generally impractical. For example, users of satellite receive only terminals could not justify a

[6] Comments of the Satellite Industry Association, GN Docket No. 17-183, page 2 (October 2, 2017)

fiber link to their facility (see Appendix). Even if economics were not an issue, fiber has several practical challenges. Fiber does not stay in the ground when placed in harsh winter environments. In many locations it is infeasible to drill fiber optic conduit trenches through miles and miles of mountains and rock, or under rivers or lakes or under airport runways, highways, and battlefields and cemeteries. Hard-scraped urban environments bring their own costly and highly regulated and time-consuming challenges when attempting to bring fiber to unserved and underserved poles, buildings and other locations.

Forest fires cause rural fiber on poles to burn up. In many locations right of ways are simply unavailable.



Fiber Availability in the United States[7]

Fiber exists between major cities and in selected zones and corridors in high density urban environments but is seldom (1) available in rural or low population areas, or (2) comprehensively available in high-density areas, especially those with lower economic demographics.[7] In fact, even the most fiber-rich areas in the United States are in need of extensive fiber investments.[8] It is not a general wide area telecommunication solution.

Another suggestion was to use other FCC radio spectrum to relocate existing users. Unfortunately this option is not practical under the assumptions of the docket (only FCC administrated spectrum is available). The nearest frequency FCC administered band with comparable bandwidth to the 4 GHz (3.700 – 4.200 GHz) and Lower 6 GHz (5.925 – 6.425 GHz) bands is 11 GHz (10.700 – 11.700 GHz). While a very popular band, the 11 GHz band is simply too high in frequency to provide the propagation characteristics required of the existing 4 and 6 GHz systems. The relocation option (if NTIA administered spectrum is unavailable) is a non-starter. Sharing with Federal spectrum should be actively pursued.

CONCLUSION

NSMA supports efforts by the FCC to increase spectrum utilization and efficiency. The Commission seeks to add wireless broadband services in bands between 3.7 and 24 GHz. The only practical way to accomplish this is to move existing users to Federal spectrum. That approach is currently not under discussion. The next approach would be for new broadband and/or unlicensed services to share spectrum with existing users. To date there is no proven

[7] See: National Broadband Map: https://www.broadbandmap.gov/technology

8 See: Deploying 5G Will Cost at Least $130 Billion in Fiber, Study Says: A Deloitte Study Found That Massive Investment in Fiber Infrastructure Will Be Required for the United States to Reach its 5G Potential, (July 10, 2017), HTTP://WWW.GOVTECH.COM/NETWORK/DEPLOYING-5G-WILL-COST-AT-LEAST-130-BILLION-IN-FIBER-STUDY-SAYS.HTML methodology for sharing these disparate services. In addition, that approach would require detailed, accurate knowledge of existing users. The Commission's license data bases must be updated before sharing can be seriously entertained. If sharing is to be feasible, new engineering procedures and federal regulations will be required. NSMA stands ready to help facilitate those procedures based upon the modified or new federal regulations.

Respectfully submitted,

/s/ George Kizer
George Kizer President,
NATIONAL SPECTRUM MANAGEMENT ASSOCIATION
P.O. Box 528
Englewood, NJ 07631
972.333.0712

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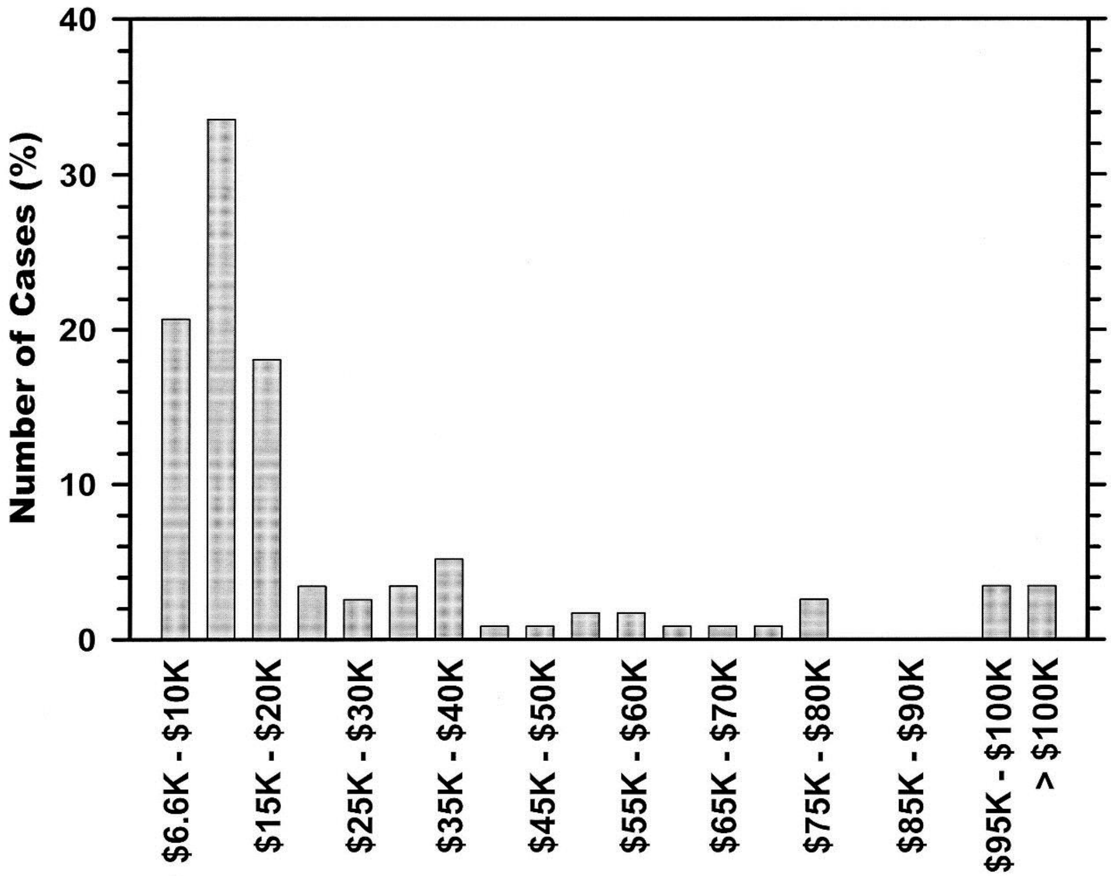
APPENDIX

Buried Fiber Optics Cable Installation Cost

George Kizer

September 2014

The United States Department of Transportation monitors fiber optics installation costs in various locations in 16 states (Alabama, Arizona, California, Colorado, Florida, Georgia, Idaho, Illinois, Kentucky, Mississippi, New York, North Carolina, Oklahoma, Texas, Washington and Wisconsin) [4]. The following chart graphs the results of 115 different installations.



Buried Fiber Optics Cable Installation Cost ($ per mile)

The minimum cost/mile was $6,600; the maximum was $267,000. The average value was $25,047; the median value was $14,256. The significant difference between average and median was due to the significant skew of the distribution. The $14,256 value seems to be most typical. However, it should be clear that installation costs are very location dependent.

When comparing satellite or fixed point to point microwave radio path cost and buried fiber cost it should be remembered that for fiber systems at least two geographically diverse paths between any two points are usually required to achieve acceptable operational availability (buried fiber outages typically average eight hours in duration [1][2][3], much longer than is acceptable for many applications). Microwave radios only require one path.

Reference:

[1] Alcoa Fujikura, Reliability of Fiber Optic Cable Systems. Franklin: Alcoa Fujikura Ltd., page 1, 2001.

[2] Ayers, M. L., Telecommunications System Reliability Engineering, Theory, and Practice. Hoboken: Wiley and Sons, page 73, 2012.

[3] Grover, W., “Fiber Cable Failure Impacts”, Mesh-Based Survivable Networks. Upper Saddle River: Prentice Hall PTR, Chapter 3, 2003.

[4] U. S. Department of Transportation Research and Innovative Technology Administration (RITA), “Fiber Optic Cable Installation Costs”, DOT web site*, July 3, 2013 *http://www.itscosts.its.dot.gov/its/benecost.nsf/DisplayRUCByUnitCostElementUnadjusted?ReadForm&UnitCostElement=Fiber+Optic+Cable+Installation+&Subsystem=Roadside+Telecommunications+